PUBLIC HEALTH REPORTS

VOL. 49 DECEMBER 28, 1934 NO. 52

THE OFFICIAL UNITED STATES AND INTERNATIONAL UNIT FOR STANDARDIZING GAS GANGRENE ANTITOXIN (*VIBRION SEPTIQUE*)

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With a view to establishing an international standard for use in measuring the potency of gas gangrene antitoxin (*Vibrion septique*), cooperative tests were undertaken by the National Institute of Health, Washington, and six foreign laboratories. The project was organized and directed by the National Institute for Medical Research, London, in compliance with the request of the Permanent Standards Commission of the Health Organization of the League of Nations that the National Institute for Medical Research prepare a "standard for gas gangrene antitoxin (*Vibrion septique*) and arrange for preliminary laboratory investigations with a view to obtaining international agreement on a standard preparation and the definition of a unit in terms of it." The suggestion was made that the work proceed along lines similar to those adopted for gas gangrene antitoxin (*Perfringens*) (1).

In the United States a provisional unit for measuring the potency of gas gangrene antitoxin (*Vibrion septique*) had been established and was in use by the biological firms manufacturing the product (2). Great Britain (3), France (4), and the Argentine Republic (5) had also prepared standards for their own countries. The relationship of these units was found to be as follows (2):

American	1
British	1/2.3
French	1/4.4
Argentine Republic	1/3.7

The National Institute for Medical Research, London, proposed that an amount exactly one-half the United States provisional unit be used as the basis of the international tests, leaving final decision

as to the size of the unit for a later meeting of the Permanent Standards Commission. This unit was designated as the provisional international unit, or the P unit. The proposal was acceded to by Dr. Weinberg, of the Pasteur Institute, Paris, and by this country.

The necessary reagents and protocols of tests were received from London in January 1934. The proposed international standard antitoxin was a dried antitoxin which had been received by the National Institute for Medical Research from Dr. Weinberg, and which had been placed in approximately 1-gram amounts into ampoules and subjected to dehydration over phosphorus pentoxide, *in vacuo*, until absolutely dry. The ampoules were filled with pure dry nitrogen, sealed, and stored in the dark at a temperature of −4° C. Tests by Dr. Hartley indicated that one provisional international unit was contained in 0.2377 mg of the dried serum. This was equivalent to 0.1566 mg of the provisional American standard.

The materials supplied for the international tests were described in the memorandum accompanying the protocols as follows:

1. A solution of gas gangrene antitoxin (*Vibrion septique*) prepared from the dry preparation made as a provisional standard at the National Institute of Health, Washington, U. S. A. (*label marked 1*).

In accordance with instructions received from Dr. McCoy, the contents of 1 ampoule were dissolved in 125 cc of a glycerol-saline solution (glycerol, 2 parts; physiological salt solution, 1 part). Of this solution, *1 cubic centimeter contains 100 P units.*

2. A solution of gas gangrene antitoxin (*Vibrion septique*) prepared by dissolving an accurately weighed quantity of the proposed international standard preparation in glycerol (2 parts), saline (1 part) (*label marked 2*). According to our determinations, 1 P unit is contained in 0.2377 mg of the proposed international standard preparation. The volume of the solution was finally adjusted so that 1 cc contains 23.77 mg of the dry standard preparation, i. e., in this case also, *1 cubic centimeter contains 100 P units.*

3. A dry preparation of gas gangrene toxin (*Vibrion septique*) (*label marked 3*). This has been prepared by precipitating the germ-free filtrate from a 3-day growth of the organism with ammonium sulphate, removing the precipitate, and drying it over phosphorus pentoxide * * *.

4. Two sealed ampoules each containing about 2.5 cc of a gas gangrene antitoxin (*Vibrion septique*) of unstated potency, for the purpose of trial assay (*label marked 4*).

The methods used at the National Institute for Medical Research, London, in carrying out the tests were described as follows:

The assay of the dry standard preparation of gas gangrene antitoxin (*Vibrion septique*) proposed for international adoption, in comparison with the American preparation, has been carried out by two methods:

A. By the intravenous injection of mixtures of toxin and antitoxin into the tail veins of mice weighing from 17 to 20 gm; and

B. By the intracutaneous injection of mixtures of toxin and antitoxin into the shaved, or depilated, flanks of white or light-colored guinea pigs weighing from 300 to 400 gm.

A. The mouse-intravenous method

By adopting the following procedure the "test dose" of the toxin supplied and the relative potencies of the glycerol solutions of the two preparations of gas gangrene antitoxin (*Vibrion septique*) may be determined in one and the same experiment:

1. 1 cc of the solution of the American provisional standard antitoxin is diluted to 20 cc.
2. 1 cc of the solution of the proposed international standard antitoxin is diluted to 20 cc.
3. A quantity of the dried toxin, V. S. 10, is quickly and accurately weighed out and dissolved in physiological salt solution, the final volume being adjusted so that 1 cc of the toxin solution contains 20 mg.
4. Mixtures of each of the antitoxin dilutions are made so that 0.5 cc of each mixture (the quantity injected intravenously into a mouse) contains 0.2 cc of the diluted antitoxin (1 P unit) + varying quantities of the toxin solution. Suitable quantities of the toxin for purposes of the test will probably be found to be between 3.5 and 4.5 mg * * *.

The mixtures are allowed to stand at room temperature for 1 hour and then 0.5 cc quantities are injected intravenously into groups of mice. The mice should be drawn from a uniform stock and should be as nearly equal in weight as practicable (17 to 20 gm). For the final comparison of the two solutions we have used groups of six or more mice for each mixture of toxin and antitoxin tested. The mice are kept under observation for 3 days; the majority of the animals which succumb to the injection die during the first 48 hours, but deaths occurring within 72 hours of the injection are regarded as significant.

In accordance with the protocols submitted, tests were performed with the reagents received. The comparative results of the British and American experiments to determine the "test dose" of the British toxin (V. S. 10) against 1 P unit of the 2 antitoxin solutions are shown in table 1. The "test dose" of the toxin used may be considered to be that amount of toxin which when mixed with one P unit of antitoxin and injected intravenously into a group of mice will kill some but not all the mice in the group. Experiment I shows this dose to be about 4.1 mg of the toxin used.

TABLE 1.—*Comparison of American and P (provisional international) sera. Mouse intravenous method. Protocol of experiments made to determine the "test dose" of British toxin V. S. 10*

I. DOSE OF TOXIN VARIED, ANTITOXIN CONSTANT

Toxin dose, mg	+0.2 cc=1 P unit (American solution)				+0.2 cc=1 P unit (proposed international solution)			
	Number of mice	Number dying	Number surviving	Proportion surviving	Number of mice	Number dying	Number surviving	Proportion surviving
4.7	6	6	0	[1] 0/6 (0/6)	6	6	0	0/6 (0/6)
4.4	6	5	1	1/6 (0/6)	6	5	1	1/6 (1/6)
4.1	6	3	3	3/6 (2/6)	6	1	5	5/6 (3/6)
3.8	6	0	6	6/6 (6/6)	6	0	6	6/6 (6/6)

IIA. DOSE OF TOXIN CONSTANT (4.1 MG), DOSE OF ANTITOXIN VARIED

Toxin dose, mg	Solution of American provisional standard antitoxin					Solution of proposed international standard antitoxin			
	P units	Number of mice			Proportion surviving	Number of mice			Proportion surviving
		Inoculated	Dying	Surviving		Inoculated	Dying	Surviving	
4.1	0.9	6	6	0	[1] 0/6 (0/6)	6	5	1	1/6 (0/6)
	1.0	6	3	3	3/6 (5/6)	6	1	5	5/6 (1/6)
	1.1	6	0	6	6/6 (6/6)	6	0	6	6/6 (6/6)

IIB. DOSE OF TOXIN CONSTANT (4.2 MG), DOSE OF ANTITOXIN VARIED

Toxin dose, mg	Solution of American provisional standard antitoxin					Solution of proposed international standard antitoxin			
	P units	Number of mice			Proportion surviving	Number of mice			Proportion surviving
		Inoculated	Dying	Surviving		Inoculated	Dying	Surviving	
4.2	0.9	6	6	0	[1] 0/6 (1/12)	6	6	0	0/6 (0/12)
	1.0	6	4	2	2/6 (5/12)	6	2	4	4/6 (7/12)
	1.1	6	0	6	6/6 (12/12)	6	1	5	5/6 (12/12)

[1] Figures in parentheses are the results of tests by the National Institute for Medical Research, London.

In experiment IIa, the "test dose" indicated in the preceding experiment was mixed with varying doses of antitoxin, and the results show that the dose of toxin may be slightly too low. In experiment IIb the dose of toxin was raised to 4.2 mg.

In the three experiments there is close agreement between the British and the American results (British results in parenthesis).

Similar tests were then carried out using the same reagents except that the American toxin was substituted for the British (table 2). Experiment I indicates that the "test dose" of the American toxin is about 5 mg. Experiment II, in which the dose of toxin was constant and the dose of antitoxin varied, shows that this amount may be a trifle high. Experiment III shows the results obtained when

one-half the P unit was tested against one-half the amount of toxin used in the preceding test, i. e., 2.5 mg, which is the "test dose" of toxin which had been in use in this country in determinations of the potency of antitoxins in terms of the American provisional unit. It may be noted that there are more survivals on proportionate doses with the more dilute reagents than with the more concentrated.

TABLE 2.—*Comparison nf American and P (provisional international) sera: Mouse intravenous method. Protocol of experiments made to determine the "test dose" of American toxin V. S. 1*

I. DOSE OF TOXIN VARIED, ANTITOXIN CONSTANT

Toxin dose, mg	+0.2 cc=1 P unit (American solution)				+0.2 cc=1 P unit (proposed international solution)			
	Number of mice	Number dying	Number surviving	Proportion surviving	Number of mice	Number dying	Number surviving	Proportion surviving
5.6	6	6	0	0/6	6	6	0	0/6
5.3	6	6	0	0/6	6	6	0	0/6
5.0	6	3	3	3/6	6	4	2	2/6
4.7	6	0	6	6/6	6	2	4	4/6
4.4	6	0	6	6/6	6	0	6	6/6

II. DOSE OF TOXIN CONSTANT (5.0 MG), DOSE OF ANTITOXIN VARIED

Toxin dose, mg	Solution of American provisional standard antitoxin					Solution of proposed international standard antitoxin			
	P units	Number of mice			Proportion surviving	Number of mice			Proportion surviving
		Inoculated	Dying	Surviving		Inoculated	Dying	Surviving	
5.0	0.9	6	6	0	0/6	6	6	0	0/6
	1.0	6	5	1	1/6	6	5	1	1/6
	1.1	6	2	4	4/6	6	1	5	5/6

III. REPETITION OF ABOVE EXPERIMENT USING ½ UNIT OF ANTITOXIN AND ½ THE AMOUNT OF TOXIN (2.5 MG)

Toxin dose, mg	Solution of American provisional standard antitoxin					Solution of proposed international standard antitoxin			
	P units	Number of mice			Proportion surviving	Number of mice			Proportion surviving
		Inoculated	Dying	Surviving		Inoculated	Dying	Surviving	
2.5	0.45	6	3	3	3/6	6	5	1	1/6
	.5	6	2	4	4/6	6	3	3	3/6
	.55	6	0	6	6/6	6	0	6	6/6

A sample of an antitoxin of unknown potency was submitted for test to the various collaborating laboratories. The potency was indicated to lie between 100 and 200 provisional international units. A preliminary test was made against the British toxin and the final tests were made against both the British and American toxins. The results with both toxins are in close agreement, and the potency is shown to be between 160 and 170 units. The results returned by the other laboratories participating in the tests as reported by Dr. Hartley were 150–155, 154, 155, 160, 160, and 170.

TABLE 3.—*Determination of P units in a sample of Vibrion septique antitoxin of unknown potency*

I. PRELIMINARY TEST

Number of P units tested for—	Amount of 1/20 dilution of antitoxin	4.1 mg British toxin			
		Number of mice injected	Number dying	Number surviving	Proportion surviving
	Cc				
200	0.10	2	2	0	0/2
166	.12	2	0	2	2/2
143	.14	2	0	2	2/2
125	.16	2	0	2	2/2
111	.18	2	0	2	2/2
100	.20	2	0	2	2/2

II. FINAL TEST

Number of P units tested for—	Amount of 1/20 dilution of antitoxin	4.2 mg British toxin				5 mg American toxin			
		Number of mice injected	Number dying	Number surviving	Proportion surviving	Number of mice injected	Number dying	Number surviving	Proportion surviving
	Cc								
200	0.10	6	6	0	0/6	6	6	0	0/6
190	.105	6	6	0	0/6	6	6	0	0/6
180	.111	6	5	1	1/6	6	6	0	0/6
170	.117	6	2	4	4/6	6	5	1	1/6
160	.125	6	1	5	5/6	6	2	4	4/6
150	.133	6	0	6	6/6	6	0	6	6/6

The specimen contains 160–170 P units.

In addition to the tests on the reagents submitted, comparative tests were made to determine the potency of one commercial antitoxin using both the British and the American toxins. The results are shown in table 4.

TABLE 4.—*Tests to determine the potency of a commercial Vibrion septique antitoxin*

I. PROTOCOL OF JUNE 3, 1933, SHOWING RESULTS OF TEST ON SERUM 259 ACCORDING TO THE METHOD OF THE NATIONAL INSTITUTE OF HEALTH, WASHINGTON

Number of units tested for	Dilution of antitoxin	Amount of dilution	Amount of toxin (American)	Number of mice			Proportion surviving
				Injected	Dying	Surviving	
		Cc	*Mg*				
90	1/60	0.25	2.5	6	0	6	6/6
100	1/100	.25	2.5	6	0	6	6/6
110	1/110	.25	2.5	6	4	2	2/6
120	1/120	.25	2.5	6	6	0	0/6
50 (U. S. standard)	1/50	.25	2.5	6	2	4	4/6

[1] The serum contains 110 provisional American units.

I. PROTOCOL OF MAR. 15, 1934, SHOWING RESULTS OF TEST ON SERUM 259 ACCORDING TO THE PROPOSED INTERNATIONAL METHOD

Number of units tested for	Dilution of antitoxin	Amount of dilution	Amount of toxin (British)	Number of mice			Proportion surviving
				Injected	Dying	Surviving	
		Cc	*Mg*				
180	1/20	0.111	4.2	6	0	6	6/6
200	1/20	.100	4.2	6	0	6	6/6
220	1/20	.091	4.2	6	4	2	2/6
240	1/20	.83	4.2	6	6	0	0/6

The serum contains 220 international units.

The first test had been carried out 9 months previously, using our own toxin and the method which was in use for determining the potency in terms of the American provisional unit. The second test was made with the British toxin according to the proposed international method. The results are in exact agreement, the serum containing 110 of the American provisional units and 220 of the proposed international units.

THE GUINEA PIG INTRACUTANEOUS METHOD

In addition to the mouse intravenous method it was recommended that the guinea pig intracutaneous method be used. This method was described as being "simple, convenient, and economical" and "yielding results comparable in accuracy with those obtained by the mouse intravenous method." White or light-colored guinea pigs weighing from 300 to 400 grams were recommended. As a result of the tests performed at the National Institute for Medical Research, London, it had been found that 0.5 mg of the toxin supplied (V. S. 10) produced a large necrotic lesion, while 0.05 mg produced a small reaction and 0.025 mg failed to produce any reaction. It was recommended that each observer decide for himself as to the most desirable end point. The antitoxin dilutions were to be made up as for the mouse test (1 to 20, so that 1 cc contained 5 units) and the toxin

dilution to such a strength that 1 cc contained 30 mg of the British toxin.

The tests were carried out as in the case of the mice, first determining the "test dose" of toxin against one provisional unit of antitoxin using varying doses of toxin. With the "test dose" of toxin established, this amount of toxin was tested against 1.1, 1.0, and 0.9 units of antitoxin. The mixtures of toxin and American standard antitoxin were injected on one flank of the guinea pig and the mixtures of toxin and the proposed international standard antitoxin on the other flank. Observations were made in 24 and 48 hours. The results are shown in table 5.

TABLE 5.—*Comparison of American and P (provisional international) sera' Guinea pig intracutaneous method. Protocol of experiments made to determine the "test dose" of British toxin V. S. 11 and American toxin V. S. 1*

(a) TOXIN DOSE VARIED, ANTITOXIN DOSE CONSTANT

I. BRITISH TOXIN V. S. 11

Antitoxin solution	Amount	Mixture prepared, volume 2 cc		Dose of mixture injected	Result after 48 hours
		Toxin	Antitoxin		
	Cc	*Mg*			
American	0.9	27	1 c c=5 units	0.2 cc	Large reaction; necrosis.
	.85	25.5			Rather large reaction; necrosis.
	.8	24			Moderate reaction; necrosis.
	.75	22.5			Slight reaction.
	.7	21			No reaction.
	.65	19.5			Do.
Proposed international	.9	27	1 c c=5 units	.2 cc	Large reaction; necrosis.
	.85	25.5			Rather large reaction, necrosis.
	.8	24			Moderate reaction; necrosis.
	.75	22.5			Slight reaction.
	.7	21			No reaction.
	.65	19.5			Do.

II. AMERICAN TOXIN V S. I

Antitoxin solution	Amount	Mixture prepared, volume 2 cc		Dose of mixture injected	Result after 48 hours
		Toxin	Antitoxin		
	Cc	*Mg*			
American	0.9	27	1 c c=5 units	0.2 cc	Marked reaction; necrosis.
	.85	25.5			Do.
	.8	24			Moderate reaction; necrosis.
	.75	22.5			Slight reaction.
	.7	21			No reaction.
	.65	19.5			Do.
Proposed international	.9	27	1 c c=5 units	.2 cc	Marked reaction; necrosis.
	.85	25.5			Do.
	.8	24			Moderate reaction; necrosis.
	.75	22.5			Slight reaction.
	.7	21			No reaction.
	.65	19.5			Do.

TABLE 5.—*Comparison of American and P (provisional international) sera. Guinea pig intracutaneous method. Protocal of experiments made to determine the "test dose" of British toxin V. S. 11 and American toxin V. S. 1*—Continued

(b) TOXIN DOSE CONSTANT, ANTITOXIN DOSE VARIED

AMERICAN TOXIN V. S. 1

Antitoxin solution	Mixture prepared, volume 2 c c			Volume of mixture injected	Result after 48 hours
	Toxin	Antitoxin			
		Cc	P units		
American	*Mg* 24	0.90	4.50	0.2 cc	Large reaction; necrosis.
		.95	4.75		Do.
		1.00	5.00		Moderate reaction.
		1.05	5.25		Slight reaction.
		1.10	5.50		No reaction.
Proposed international	24	.90	4.50		Large reaction; necrosis.
		.95	4.75		Do.
		1.00	5.00		Moderate reaction.
		1.05	5.25		Slight reaction.
		1.10	5.50		No reaction.

As in the case of the mouse tests, the tests were carried out first with the British toxin (a second lot V. S. 11) and then with the American toxin. The results with the two antitoxins against each toxin checked closely with those obtained by the National Institute for Medical Research, London.

The intracutaneous test was also used in determining the strength of the antitoxin of unknown potency submitted for test. The American toxin was used in this test. The results (table 6) confirmed those obtained in mice.

TABLE 6.—*The intracutaneous guinea pig method. The sample of Vibrion septique antitoxin of unknown potency (American toxin)*

No.	Toxin 24 mg in 1 cc	Antitoxin 1/20 dilution	Salt solution	Volume of mixture injected intracutaneously	Actual quantities injected		Result after 48 hours
					Toxin	Antitoxin	
		Cc	*Cc*	*Cc*	*Mg*	*Cc*	
1	0.8	0.555	0.645	0.2	2.4	0.00278	Large reaction, necrosis.
2		.585	.615			.00293	Do.
3		.625	.575			.00313	Moderate reaction.
4		.675	.525			.00338	Slight reaction.
5		.714	.486			.00367	No reaction.
Control	.8	5 P units in 1 cc.	0	.2	2.4	0.5 unit	Moderate reaction.

The sample of antitoxin contains 160 to 170 P (proposed international) units per cc.

The results obtained in the above tests were submitted to the meeting of the Permanent Commission on Biological Standardization of the Health Organization of the League of Nations at Copenhagen, in August 1934, as were those of the six other participating laboratories. At this meeting the following resolution was adopted:

"The Commission recommends:

"1. That the dry preparation of gas gangrene antitoxin (*Vibrion septique*), prepared at the National Institute for Medical Research, London, from material supplied by Dr. Weinberg of the Pasteur Institute, Paris, be accepted as the international standard for this antitoxin and that the specific antitoxic activity contained in 0.2377 mg of the dried standard preparation be defined as the international unit."

(The antitoxin in 0.2377 mg of the international unit is equivalent to one-half the amount of antitoxin contained in the provisional American unit, viz 0.1566 mg.)

In accordance with the international agreement regarding the size of the unit, the following statement was issued by the National Institute of Health, Washington:

NATIONAL INSTITUTE OF HEALTH,
Twenty-fifth and E Streets NW., Washington, D. C.,
September 30, 1934.

It is proposed to adopt as the official unit for the measurement of the potency of gas gangrene antitoxin (*Vibrion septique*) the equivalent of the International unit adopted by the Permanent Commission on Biological Standardization of the Health Organization of the League of Nations. This unit is one-half that previously proposed as a provisional unit for the United States (Pub. Health Rep., 1934, **49**, 251) and is that amount of antitoxin contained in 0.1566 mg of the dried standard serum prepared at the National Institute of Health. The dried serum as dissolved and diluted for distribution contains 100 units in 1 cc.

The standard unit will be distributed on special request addressed to the director of the National Institute of Health.

It is expected that this unit will be employed by all producers not later than January 1, 1935.

G. W. McCOY,
Director, National Institute of Health.

Following the adoption of a unit one-half that previously in use as a unit of measurement for this country, the question arose whether it would be advisable to carry out the test as it had been done previously, merely changing the factor used in calculating the number of units, or whether it would be better to use the international method. Our method in the mouse test was based on the use of such a dilution of the antitoxin that 1/2 the unit (1/4 the former provisional unit) was contained in 0.25 cc of a 1/50 dilution of the glycerinated antitoxin. By chance the "test dose" of the standard toxin against this dose of antitoxin was 0.25 cc of a 1/100 dilution (10 mg to 1 cc) of the toxin. The

sum of the doses of toxin and antitoxin was therefore exactly 0.5 cc, a convenient dose for the intravenous inoculation of mice. The international method was based on the use of such a dilution of the standard antitoxin that 1 unit was contained in 0.2 cc of a 1/20 dilution of the glycerinated antitoxin. The test dose of the British toxin against this amount of toxin was 4.2 mg, or 2.1 cc of a 1/50 dilution of the toxin (20 mg per cc). The doses of toxin and antitoxin were therefore twice as concentrated in the international tests as they were in the American tests.

In order to determine the effect of varying the dilutions of toxin and antitoxin in multiple proportions, tests were carried out in mice and also in rabbits. The antitoxin was diluted 1/25, 1/50, and 1/100 and the toxin was diluted so that 1 c c contained 20 mg, 10 mg, and 5 mg. The results of the test in mice are shown in table 7.

TABLE 7.—*Effect of diluting the toxin and antitoxin in multiple proportions*

Antitoxin			Toxin		Number of mice	Proportion surviving
Dilution	Amount of dilution	Number of units	Dilution	Amount of dilution		
	Cc		*Mg per cc*	*Cc*		
1/100	0.25	1/4	5	0.25	6	3/6
1/50	.25	1/2	10	.25	6	3/6
1/25	.25	1	20	.25	6	0/6

A larger proportion of mice inoculated with the more concentrated reagents died—in this case all the mice in the group of 6 inoculated with the mixture of the 1/25 dilution of antitoxin and the dilution of toxin containing 20 mg per cubic centimeter. A similar tendency was shown in tests II and III, table 2. The discrepancy is probably not sufficiently great, however, to warrant a definite fixing of one particular method of making the dilutions of the reagents to the exclusion of the others in the case of mice. A test carried out with a commercial antitoxin, however, in which a range of doses of antitoxin was tested against the "test dose" of toxin indicated that it was difficult to establish a definite end point with the more dilute solutions. The dilution 1/50 of the antitoxin, using 0.5 unit in the mouse test, appears to be entirely satisfactory.

There were marked discrepancies in the results in rabbits, on the other hand, when dilutions of toxin and antitoxin were varied in multiple proportions. Dilutions of the reagents were made as for the mice. The results are shown in table 8.

TABLE 8.—*Effect of diluting the toxin and antitoxin in multiple proportions in rabbits*

Antitoxin			Toxin		Number of rabbits	Proportion surviving
Dilution	Amount of dilution per kg	Number of units per cc	Dilution	Dose per kg		
	Cc		*Mg per cc*	*Mg*		
1/100	1.0	1	5	6.5	4	4/4
1/100	1.0	1	5	6.0	4	4/4
1/100	1.0	1	5	5.5	4	4/4
1/100	1.0	1	5	5.0	4	4/4
1/50	1.0	2	10	13	7	1/7
1/50	1.0	2	10	12	7	3/7
1/50	1.0	2	10	11	7	5/7
1/50	1.0	2	10	10	3	3/3
1/25	1.0	4	20	26	4	0/4
1/25	1.0	4	20	24	4	0/4
1/25	1.0	4	20	22	4	0/4
1/25	1.0	4	20	20	3	2/3

Using 1 cc per kg of a 1/50 dilution of the standard antitoxin against doses of toxin ranging from 11 to 13 mg per kilogram, some animals died and some survived. When the concentration of the reagents was doubled, all of the animals died; when it was halved, all of the animals survived. The more dilute solution of the antitoxin (1/100) neutralized completely the corresponding doses of toxin so that there remained unneutralized less than one minimal lethal dose, the more concentrated solution of the antitoxin (1/25) failed to neutralize completely the corresponding doses of toxin so that one or more minimal lethal doses remained unneutralized.

In view of the above results and for the reason that the rabbit and mouse tests were correlated in our original work in establishing the provisional unit, it seems desirable to continue the use of the 1/50 dilution of the glycerinated antitoxin (2 international units per cc).

It may therefore be concluded that the most satisfactory results with our standard reagents may be obtained if the test is carried out as formerly, multiplying the number of units obtained thus by the factor 2. The glycerinated solution of the antitoxin is diluted 1/50, and in the mouse test 0.25 cc of this dilution (0.5 unit) is tested against the "test dose" 2.5 mg of the standard toxin. In the rabbit test 1 cc per kilogram of the same dilution (2 units) is tested against a "test dose" of 12 to 13 mg per kilogram of the standard toxin.

SUMMARY

As one of the participants in a project to establish an international unit for use in determining the potency of gas gangrene antitoxin (*Vibrion septique*), a comparison was made of the proposed international antitoxin and the American standard antitoxin, using reagents supplied by the National Institute for Medical Research,

London. The proposed international unit was contained in 0.2377 mg of a dried serum preparation and this was equivalent to 0.1566 mg of the American standard antitoxin—one-half the American provisional unit.

Protocols of tests made at the National Institute for Medical Research, London, were submitted to the various countries participating in the tests. The correctness of the British assay of the international unit was confirmed by tests on mice (intravenous inoculation) and guinea pigs (intracutaneous inoculation), testing with both the British and American toxins.

Results obtained in evaluating a specimen of antitoxin of unknown potency agreed well with those obtained by the six other laboratories participating in the tests. A commercial antitoxin was also evaluated, using both the American and British toxins with identical results.

The proposed international unit, equivalent to one-half of the American provisional unit, was adopted as the international unit of gas gangrene antitoxin (*Vibrion septique*) at a meeting of the Permanent Commission on Biological Standardization of the Health Organization of the League of Nations in Copenhagen, Denmark, in August 1934. The international unit was adopted as the United States official unit in September 1934.

As the result of tests on mice and rabbits for the purpose of determining the best application of the international unit in the measurement of the potency of gas gangrene antitoxin (*Vibrion septique*) it was shown that the most satisfactory results with the American reagents were obtained by performing the tests as formerly in determining provisional units and multiplying by the factor 2.

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THE INFLUENCE OF VITAMIN B_2 ON HEMATOPOIESIS IN EXPERIMENTAL ANEMIA OF THE ALBINO RAT

By Maurice I. Smith, *Principal Pharmacologist*, and E. F. Stohlman, *Junior Pharmacologist, United States Public Health Service, National Institute of Health*

Anemia is often a marked feature in clinical pellagra. Experimentally, Rhoads and Miller (1) observed anemia in dogs on diets producing black-tongue. The work of Castle and Strauss (2) suggests a close relationship between the extrinsic factor in pernicious anemia

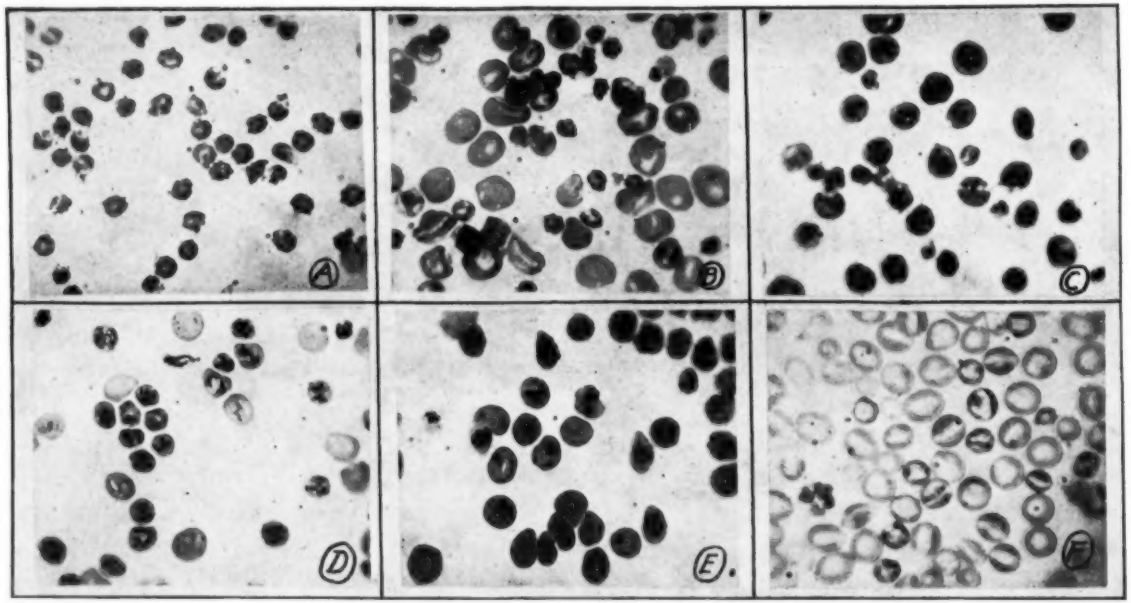
and vitamin B_2. Guha and Mapson (3) observed a diminution of erythrocytes in rats on a diet deficient in B_2, which they state was restored to normal by feeding autoclaved marmite (a yeast extract). Wills and Bilimoria (4) reported an anemic condition in monkeys on a diet deficient in vitamin B which was corrected by the addition of marmite to the diet. Certain reports to the effect that potent antianemic liver extracts are also active with respect to B_2 further suggest a possible relationship. There is, however, lack of agreement on this point (5).

We have attempted to approach this problem by comparing the rate of hemoglobin and red-blood cell regeneration in animals with a standard degree of anemia under adequate dietary conditions with that under conditions of B_2 deficiency. Albino rats were used because this species is the most suitable for rigidly controlled nutritional investigations. The type of experimental anemia employed in this work was that produced by means of phenylhydrazine. We have found this substance particularly suitable for our purpose, because of its specificity and the quantitative relationship between dosage and effect.

PHENYLHYDRAZINE ANEMIA IN THE WHITE RAT ON AN ADEQUATE DIET

The destructive action of phenylhydrazine on the blood has been well known. Bodansky (6) studied the effect of a series of hydrazine compounds in dogs and rabbits and concluded that phenylhydrazine was the most effective anemia-producing agent. We are not aware of any detailed study of the effects of phenylhydrazine in the rat which, in the course of this work, has been found to react in certain essentials quite differently from other animal species reported heretofore.

The maximum tolerated dose of phenylhydrazine hydrochloride upon intravenous injection in the normal rat in 1 percent solution is about 80 mg per kilo. While a single injection of such a dose will produce a moderate degree of anemia, it has been found that three successive daily injections of smaller doses, such as 40 to 60 mg per kilo, will produce a rather severe degree of anemia, with the hemoglobin and red cells reduced to about one-third of the normal. Such doses have no apparent toxic effects other than the destructive action on the blood and a temporary loss of weight. The blood-cell characteristics are somewhat as follows: Twenty-four hours after the last injection, Wright's preparations show numerous microcytes and poikilocytes. The cells present marked crenation, and various stages of disintegration (plate I, A). The following day polychromasic macrocytes make their appearance. Anisocytosis, poikilocytosis, polychromatophilia, and considerable numbers of nucleated red cells may now be seen (plate I, B). In a cresyl blue preparation many reticulo-



A, Blood film 24 hours after last of three intravenous injections of phenylhydrazine, showing various stages of disintegration of red blood cells. Wright's stain. × 800. *B*, Blood film one day later. Microcytes, poikilocytes, polychromatophilic macrocytes, and erythroblasts. Wright's stain. × 800. *C*, Preparation showing many reticulocytes along with microcytes, macrocytes, and erythroblasts. Third day. Cresyl blue counterstained with Wright's stain. × 800. *D* and *E*, Eighty to ninety percent reticulocytes 3 to 4 days after the last injection of phenylhydrazine. Cresyl blue and Wright's stain. × 800. *F*, Wright's preparation 4 days after the last injection of phenylhydrazine. Cells nearly normal except for some anisocytosis and polychromatophilia. × 800. (All reduced approximately one-third.)

cytes may be seen among the microcytes (plate I, C).[1] The reticulocytes now usually rapidly increase in number so that on the third or fourth day as much as 90 percent of the circulating red-blood cells may be reticulocytes (plate I, D and E). Wright's preparations at

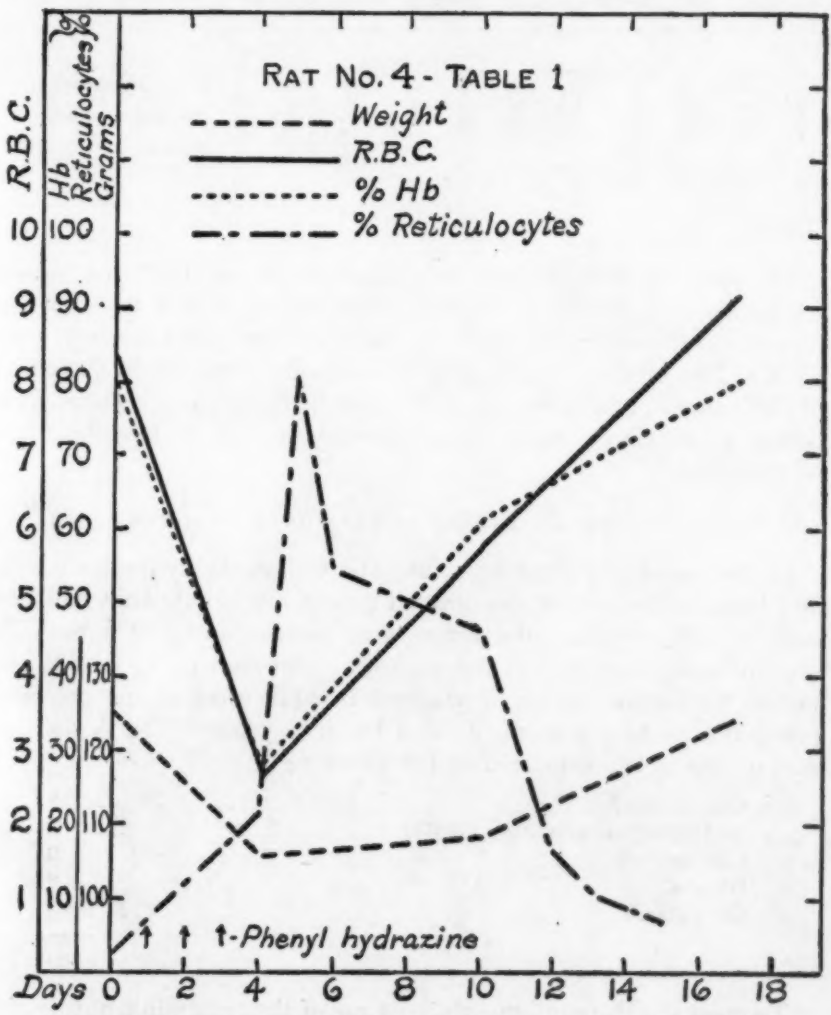


FIGURE 1.—Blood regeneration in phenylhydrazine anemia of rat on standard adequate diet.

this time usually present a nearly normal appearance, except for some polychromatophilia (plate I, F). Recovery now proceeds rapidly so that by the eighth or tenth day the blood picture presents a normal appearance, the reticulocytes being usually less than 1 percent.

[1] Reticulocytes were stained essentially by the method of Osgood and Wilhelm (9).

TABLE 1.—*Hematopoiesis in the white rat on a standard adequate diet following a standard dose of phenylhydrazine hydrochloride*

No.	Normal			Extent of anemia			Recovery				Maximum percentage of reticulocytes observed during recovery
	Weight	RBC	Hb	Weight	RBC	Hb	Days	Weight	RBC	Hb	
	Grams		*Per-cent*	*Grams*		*Per-cent*		*Grams*		*Per-cent*	
1	164	10.46	98	129	3.18	30	[1] 4	140	4.91	58	14 percent on fourth day.
2	185	10.30	95	150	3.97	35	10	184	8.41	88	
3	210	10.59	89	180	3.72	55	12	218	9.03	90	30 percent on fifth day.
4	126	8.29	79	106	2.58	27	6	108	5.75	61	
							13	123	9.22	79	80 percent on third day.
5	130	8.73	74	114	2.49	33	7	130	8.12	87	90 percent on fourth day.
6	202	10.50	90	186	3.52	36	8	218	8.26	96	

[1] Killed on fifth day.

The progress of the anemia as judged by hemoglobin [2] and red cell regeneration is shown in table 1, from which it will be seen that recovery is in evidence as early as the fourth day, and is nearly complete in 7 to 10 days. The color index tends to mount in the course of the anemia, and more especially during the recovery phase, indicating a relatively more rapid regeneration of hemoglobin than erythrocytes.

PHENYLHYDRAZINE ANEMIA IN RATS ON B_2 DEFICIENT DIET

In this series of experiments the extent of phenylhydrazine anemia and blood regeneration was studied in a group of rats that had been kept on a B_2 deficient diet for varying periods up to 80 days. The diet differed from that in the preceding experiments in that it contained no known source of vitamin B, while that of the preceding group contained 5 percent of dried brewer's yeast. The B_2 deficient diet of this group consisted of the following:

Casein, purified	18
McCollum's salt mixture (185(7))	4
Cod-liver oil	2
Olive oil	8
Corn starch	68
	100

To meet the B_1 requirements, 0.04 mg of the crystalline antineuritic vitamin hydrochloride was injected intravenously at 4- to 5-day intervals. This is more than 5 times the minimal B_1 requirement of the rat.[3] On this diet rats maintain body weight with but slight losses, and almost uniformly develop typical skin lesions, in from

[2] Newcomer hemoglobinometer.

[3] We are indebted to Dr. R. R. Williams, of Columbia University, for a generous supply of the B_1 crystals. An assay of this material by the method used in this laboratory (8) showed that it had an activity of 0.007 mg as the minimum curative dose, which is sufficient to bring about a remission in beri-beri rats for about 5 days.

6 to 12 weeks. The chief characteristics of the skin lesions are bleeding fissures in the corners of the mouth, and erythema, edema, exudation, desquamation, and even ulceration of the toes and feet. The addition of active B_2 preparations for a few days causes resumption of growth and prompt healing with disappearance of the lesions.

Rats of the above description appear to be somewhat more susceptible to the toxic effects of phenylhydrazine. Consequently, several rats receiving doses well tolerated by the animals of the preceding group died during the injection period. In the successful experiments, the dose of phenylhydrazine was reduced somewhat, so that in the experiments summarized in table 2 usually three doses of 30 to 50 mg per kilo each were given on successive days.

TABLE 2.—*Hematopoiesis in the white rat on B_2-deficient diet following a standard dose of phenylhydrazine hydrochloride* [1]

No.	Days on deficient diet	Preanemic state			Extent of anemia			Recovery				Maximum percentage of reticulocytes observed during recovery
		Weight	RBC	Hb	Weight	RBC	Hb	Days	Weight	RBC	Hb	
		Grams		*Percent*	*Grams*		*Percent*		*Grams*		*Percent*	
1	47	130	10.28	90	114	3.12	32	7	------	6.22	71	82 percent on fourth day.
								13	112	9.72	86	
2	60	94	8.22	74	90	4.79	38	7	------	5.54	58	63 percent on fifth day.
								15	100	9.32	76	
3	67	122	10.12	78	114	4.78	35	6	------	4.55	62	60 percent on fourth day.
								14	122	7.95	81	
4	77	126	9.92	82	118	2.80	32	9	------	5.87	62	90 percent on third, fourth, and fifth days.
								14	122	8.22	80	
5	80	90	8.72	74	86	6.02	47	11	------	6.21	68	36 percent on sixth day.
								19	84	8.32	70	
6	32	164	11.46	94	148	4.35	35	11	158	8.54	92	3 percent on third and fifth days.
7	36	104	13.38	100	92	3.77	27	7	94	7.29	72	21 percent on seventh day.
8	41	142	12.04	108	118	2.78	27	13	94	7.73	72	17 percent on second, fourth, and seventh days.
9	50	130	9.74	86	108	2.79	35	15	105	8.02	56	26 percent on seventh day.

[1] Experiments 6–9 also restricted iron intake. See text.

Experiments 1–5 (table 2) show the condition of the blood in rats on B_2-deficient diet up to 80 days, the extent of anemia produced by phenylhydrazine, the extent of recovery from this anemia, and the highest degree of reticulocytosis observed during recovery. Experiments 6–9 give similar data for a group of rats subsisting on a restricted iron intake in addition to the B_2 deficiency. The restriction was effected by omitting iron citrate from salt mixture 185 of the synthetic diet. The restriction was only partial, however, for analysis of the constituents of the synthetic diet indicated 20 mg of iron per 100

gm of casein and 2.4 mg of iron per 100 gm of starch, with negligible traces for the other ingredients.[4] Calculation showed that the rats of this group received about 0.5 mg of iron per day as against some 5 mg in the unrestricted group.

Analysis of the data in table 2 indicates that absence of B_2 from the diet neither affects the normal production of red blood cells or hemo-

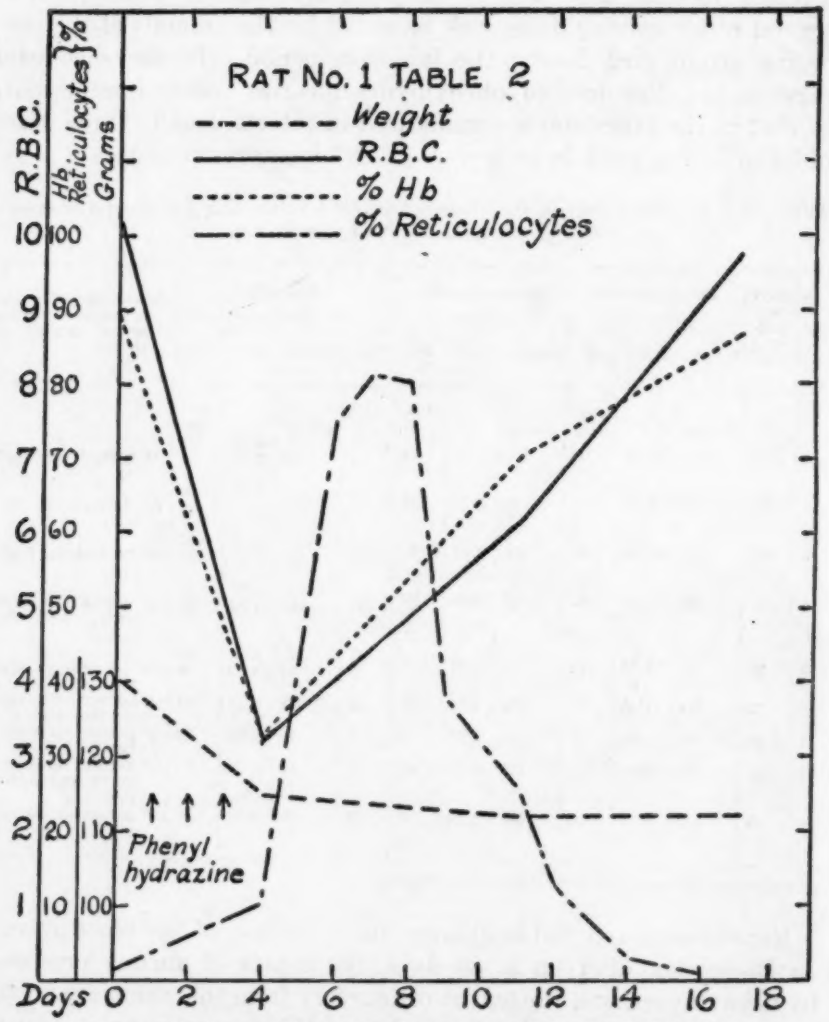


FIGURE 2.—Blood regeneration in phenylhydrazine anemia of rat on B_2 deficient diet.

globin in the rat, nor does it seriously impair the regeneration of hemoglobin and red cells destroyed by means of phenylhydrazine. There is also the same general tendency for the color index to mount during the recovery phase in this group as in the preceding group on the adequate diet. A comparison of the recovery phase in tables 1 and 2

[4] We are indebted to Dr. E. Elvove, of this laboratory, for the iron analyses.

would, however, seem to suggest a somewhat retarded rate of regeneration especially in the group deficient in B_2 with restricted iron intake. Reticulocytosis also appears to have been less pronounced in this group of animals. In any event, the effect of B_2 deficiency is only slight, and the conclusion seems justified that vitamin B_2 is not concerned with hematopoiesis in the white rat.

SUMMARY AND CONCLUSIONS

A standard procedure for the production of a moderately severe anemia in the albino rat by means of phenylhydrazine is described.

In the normal rat this anemia is transient in character, complete recovery taking place in about 10 days. The early stages of recovery are accompanied by pronounced reticulocytosis.

Elimination of the B_2 vitamin from the dietary of the rat does not materially affect the progress of recovery from the standard phenylhydrazine anemia.

Vitamin B_2 does not appear to be concerned with hematopoiesis in the albino rat.

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COURT DECISION ON PUBLIC HEALTH

Chronic benzol poisoning held compensable under workmen's compensation act.—(Minnesota Supreme Court; *Funk* v. *Minnesota Mining & Mfg. Co. et al.*, 256 N. W. 889; decided October 26, 1934.) Subdivision 9 of section 4327, Mason's Minnesota Statutes 1927, provided that, for the purposes of the workmen's compensation act, only the diseases enumerated in such subdivision should be deemed to be occupational diseases and hence compensable. The said subdivision contained a schedule in two columns. In column one there was a description of the diseases and in column two a description of the processes which raised a presumption that the disease was due to the nature of the employment in which the employee was engaged. Paragraph 7 of column 1 of subdivision 9 read:

> Poisoning by nitro and amido-derivatives of benzine (dinitro-benzol, anilin and others), or its sequelae.

Opposite this paragraph in column 2 was the following:

Any process involving the use of a nitro or amido-derivative of benzine or its preparations or compounds.

In the instant case the State industrial commission awarded compensation for chronic benzol poisoning. The employee had been engaged in the production of rubber cement tape. Benzol was placed in a mixing churn and rubber and other solid ingredients were added to the contents of the churn which continued the mixing process for about 24 hours. The compound or preparation was then drawn into five-gallon cans and taken to a box or hopper where it was spread upon the material to be made into tape. The employee was engaged, among other duties, in pouring the preparation into the box or hopper. In so doing he was exposed to the fumes from the benzol preparation and was disabled.

On appeal to the supreme court that court stated that the sole question presented was whether chronic benzol poisoning came within the definition contained in paragraph 7 above set out. In affirming the decision of the industrial commission the appellate court said:

It is conceded that the word "benzine" was used by the legislature as meaning benzene or benzol, C_6H_6, and not C_nH_{2n+2}, the ordinary benzine. The effects of poisoning from the fumes of the benzol derivatives are usually acute, while those from benzol are characterized as chronic. Did the legislature intend to distinguish between benzol and its derivatives and to include the latter and exclude the former as a cause of occupational disease? It is conceded that benzol poisoning is a typical occupational disease in the general sense, and might well have been included in the coverage of subdivision 9. If the legislature intended to exclude benzol, there was no rational basis for the exclusion. We think the language of column 1 should be interpreted liberally in connection with that in column 2, where "its" evidently refers to benzol and "preparations" apparently would cover mixtures such as that which caused respondent's disability. Therefore benzol poisoning is properly compensable when occurring under the circumstances set out in column 2. The decision of the commission is affirmed and the writ discharged.

DEATHS DURING WEEK ENDED DEC. 8, 1934

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Dec. 8, 1934	Corresponding week, 1933
Data from 86 large cities of the United States:		
Total deaths	8,383	8,601
Deaths per 1,000 population, annual basis	11.7	12.0
Deaths under 1 year of age	592	623
Deaths under 1 year of age per 1,000 estimated live births	55	[1] 53
Deaths per 1,000 population, annual basis, first 49 weeks of year	11.3	10.9
Data from industrial insurance companies:		
Policies in force	67,105,185	67,326,257
Number of death claims	12,331	13,845
Death claims per 1,000 policies in force, annual rate	9.6	10.7
Death claims per 1,000 policies, first 49 weeks of year, annual rate	9.8	9.8

[1] Data for 81 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers

Reports for Weeks Ended December 15, 1934, and December 16, 1933

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Dec. 15, 1934, and Dec. 16, 1933

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933
New England States:								
Maine	2	3	1	15	48	1	1	0
New Hampshire		1			7	12	0	0
Vermont	6	3			7	59	0	0
Massachusetts	21	26			195	482	3	1
Rhode Island	5	2			3	9	1	1
Connecticut	1	10	6	4	314	17	1	0
Middle Atlantic States:								
New York	37	54	[1] 61	[1] 28	787	584	3	3
New Jersey	32	25	64	20	54	99	0	0
Pennsylvania	75	51			989	327	2	3
East North Central States:								
Ohio	97	65	60	101	271	120	1	3
Indiana	31	65	46	51	232	39	0	2
Illinois	48	52	21	11	778	34	1	4
Michigan	16	26	19	4	191	37	0	0
Wisconsin	4	13	15	17	353	161	1	3
West North Central States:								
Minnesota	31	8			812	8	2	1
Iowa [2]	15	18	31	1	784	30	0	1
Missouri	62	80	78	6	120	112	0	2
North Dakota	11	10	11	2	124	33	0	1
South Dakota		22			38	217	1	0
Nebraska	9	6			42	13	1	1
Kansas	8	29		1	207	43	1	0
South Atlantic States:								
Delaware	2	1			1	1	0	1
Maryland [2] [3]	19	25	12	20	81	21	0	0
District of Columbia	9	10	1	1	5	25	0	1
Virginia	52	67			165	87	4	0
West Virginia	47	47	94	14	236	6	2	2
North Carolina [2]	53	60	22	14	505	503	4	2
South Carolina [2]	5	14	419	459	4	125	0	0
Georgia [2]	13	35				299	2	1
Florida	15	22		3	8		1	1

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Dec. 15, 1934, and Dec. 16, 1933—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933
East South Central States:								
Kentucky	36	60	38	25	152	4	2	1
Tennessee [4]	30	44	59	113	76	269	0	1
Alabama [3]	20	33	56	47	44	114	2	1
Mississippi [3]	15	19					0	0
West South Central States:								
Arkansas	15	18	44	32	10	294	0	0
Louisiana	30	30	14	11	19	1	0	0
Oklahoma [3]	10	70	98	53	1	39	0	0
Texas [3]	88	207	288	143	19	193	1	0
Mountain States:								
Montana	8	7	14	5	81	2	1	2
Idaho					5	10	0	0
Wyoming	1				15	34	0	0
Colorado	7	12			287	4	2	0
New Mexico		10	2		49	74	0	0
Arizona	2	5	18	20	5	3	0	0
Utah [3]	1		2	2	12	129	0	1
Pacific States:								
Washington	3	6		3	37	219	1	0
Oregon		1	36	17	27	18	0	0
California	63	32	41	48	171	137	2	3
Total	1,055	1,404	1,671	1,301	8,371	5,048	43	43

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933
New England States:								
Maine	2	0	35	10	0	0	3	1
New Hampshire	0	1	8	12	0	0	0	1
Vermont	0	0	27	15	0	0	1	3
Massachusetts	0	0	170	222	0	0	2	3
Rhode Island	0	0	13	17	0	0	0	1
Connecticut	0	0	39	55	0	0	1	0
Middle Atlantic States:								
New York	1	7	429	466	0	0	16	8
New Jersey	0	1	129	146	0	0	5	5
Pennsylvania	2	1	542	418	0	0	20	12
East North Central States:								
Ohio	4	4	549	553	5	2	19	7
Indiana	6	1	203	183	3	4	4	4
Illinois	0	1	558	379	3	3	16	7
Michigan	1	1	283	293	0	0	7	11
Wisconsin	2	1	487	101	17	64	2	0
West North Central States:								
Minnesota	0	0	137	100	6	3	0	2
Iowa [3]	1	0	60	87	1	1	3	4
Missouri	0	0	84	131	2	3	9	1
North Dakota	0	0	59	34	0	0	1	1
South Dakota	0	0	19	11	6	0	1	0
Nebraska	0	0	29	28	20	2	1	5
Kansas	1	0	77	115	2	7	2	5
South Atlantic States:								
Delaware	0	1	20	6	0	0	0	1
Maryland [3] [5]	1	0	117	80	0	0	6	9
District of Columbia	0	0	17	14	0	0	0	1
Virginia	0	0	119	128	14	0	12	16
West Virginia	1	0	153	144	0	0	21	7
North Carolina [3]	0	0	84	131	0	1	4	6
South Carolina [3]	0	0	3	21	0	0	1	6
Georgia [3]	0	3		27	0	0	11	11
Florida	0	0	4	5	0	0	2	2

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Dec. 15, 1934, and Dec. 16, 1933—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933	Week ended Dec. 15, 1934	Week ended Dec. 16, 1933
East South Central States:								
Kentucky	0	0	66	114	0	0	11	5
Tennessee [4]	1	0	61	129	1	2	12	6
Alabama [3]	0	1	22	37	1	0	15	4
Mississippi [3]	1	1	24	25	1	3	2	0
West South Central States:								
Arkansas	0	0	19	15	9	2	13	3
Louisiana	0	1	21	14	0	30	8	15
Oklahoma [5]	0	1	27	47	1	0	15	5
Texas [3]	0	0	78	122	1	12	42	35
Mountain States:								
Montana	3	0	37	15	1	18	2	2
Idaho	0	0	2	8	0	1	6	0
Wyoming	0	0	18	12	1	0	0	0
Colorado	0	0	245	19	1	3	1	8
New Mexico	0	0	20	33	0	0	10	6
Arizona	0	0	10	13	0	0	6	1
Utah [2]	0	0	37	10	1	11	1	0
Pacific States:								
Washington	8	4	44	37	52	2	2	3
Oregon	1	1	82	44	0	9	2	2
California	14	6	260	205	15	8	5	20
Total	50	37	5,527	4,831	165	191	323	255

[1] New York City only.
[2] Week ended earlier than Saturday.
[3] Typhus fever, week ended Dec. 15, 1934, 31 cases, as follows: Maryland, 1; North Carolina, 1; South Carolina, 2; Georgia, 13; Alabama, 6; Texas, 8.
[4] Rocky Mountain spotted fever, week ended Dec. 15, 1934, Tennessee, 1 case.
[5] Exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
August 1934										
Colorado	2	15		2	59		4	58	3	57
September 1934										
Colorado	1	25			29		3	104	8	25
Georgia	3	67	107	517	11	21	3	56	0	248
October 1934										
Arkansas					4				2	
Puerto Rico		54	74,764	1,242	113		0		0	11
November 1934										
California	3	207	117	12	696	6	100	767	10	56
Florida		69	1	102	19	2	1	27	0	8
Iowa	2	51	4		905		5	285	5	11
Missouri	6	322	187	65	411		5	408	17	121
New Jersey	5	92	88	1	172		1	451	0	25
New Mexico	4	27	16	5	190		2	101	1	83
New York	16	179		12	3,119		8	1,473	0	50
Ohio	3	440	115	3	652		17	2,390	7	31
Tennessee	1	254	172	119	57	9	6	388	0	61

August 1934

	Cases
Colorado:	
Anthrax	1
Chicken pox	5
Dysentery	1
Impetigo contagiosa	1
Lethargic encephalitis	5
Mumps	23
Undulant fever	1
Vincent's infection	1
Whooping cough	123

September 1934

	Cases
Colorado:	
Chicken pox	30
Dysentery	1
Impetigo contagiosa	1
Lethargic encephalitis	1
Mumps	17
Vincent's infection	13
Whooping cough	68
Georgia:	
Chicken pox	9
Dengue	9
Dysentery (amoebic)	8
Dysentery (bacillary)	16
Hookworm disease	164
Lethargic encephalitis	2
Mumps	26
Paratyphoid fever	1
Rabies in man	1
Septic sore throat	35
Tularaemia	2
Typhus fever	48
Undulant fever	9
Whooping cough	109

October 1934

	Cases
Arkansas:	
Chicken pox	3
Mumps	5
Trachoma	11
Tularaemia	1
Undulant fever	1
Whooping cough	111
Puerto Rico:	
Chicken pox	26
Dysentery	67
Filariasis	3
Mumps	27
Ophthalmia neonatorum	3
Puerperal septicemia	8
Tetanus	9
Tetanus, infantile	9
Trachoma	31
Whooping cough	155

November 1934

	Cases
Actinomycosis:	
California	1
Chicken pox:	
California	1,035
Florida	7
Iowa	485
Missouri	269
New Jersey	1,255
New Mexico	30
New York	2,597
Ohio	2,697
Tennessee	189
Dengue:	
Florida	51
Diarrhea and enteritis:	
Ohio (under 2 years)	13
Dysentery:	
California (amoebic)	7
California (bacillary)	39
Florida	1
Missouri	40
New Jersey	7
New Mexico	12
New York (amoebic)	4
New York (bacillary)	91
Ohio	1
Tennessee	12
Food poisoning:	
California	21
Ohio	17
German measles:	
California	51
New Jersey	33
New Mexico	16
New York	127
Ohio	168
Tennessee	2
Granuloma, coccidioidal:	
California	4
Impetigo contagiosa:	
Tennessee	11
Jaundice, epidemic:	
California	1
Lead poisoning:	
New Jersey	2
Ohio	10
Lethargic encephalitis:	
California	4
Iowa	1
Missouri	3
New Jersey	2
New York	8
Ohio	1
Tennessee	2
Milk sickness:	
New Mexico	1
Mumps:	
California	411
Florida	7
Iowa	203
Missouri	61
New Jersey	364
New Mexico	9
Ohio	330
Tennessee	30
Ophthalmia neonatorum:	
California	2
Missouri	1
New Jersey	2
New York	10
Ohio	80
Tennessee	1
Paratyphoid fever:	
California	5
New York	3
Ohio	1
Tennessee	1
Puerperal septicemia:	
New Mexico	1
Ohio	4
Rabies in animals:	
California	51
Missouri	15
New Jersey	13
New York [1]	1
Rabies in man:	
Missouri	2
Relapsing fever:	
California	1
Scabies:	
Tennessee	3
Septic sore throat:	
California	16
Missouri	37
New York	23
Ohio	263
Tennessee	18
Tetanus:	
California	8
Missouri	2
New Jersey	1
New York	7
Tennessee	1
Trachoma:	
California	17
Missouri	5
New Jersey	1
New Mexico	1
Ohio	1
Tennessee	55
Trichinosis:	
California	9
Iowa	2
New Jersey	1
New York	23
Tularaemia:	
Iowa	4
Missouri	4
Ohio	13
Tennessee	1
Typhus fever:	
Florida	1
New York	2
Undulant fever:	
California	11
Iowa	18
Missouri	7
New Jersey	1
New Mexico	1
New York	26
Ohio	3
Vincent's infection:	
Iowa	1
New York [1]	53
Tennessee	6
Whooping cough:	
California	276
Florida	32
Iowa	51
Missouri	413
New Jersey	919
New Mexico	45
New York	2,640
Ohio	505
Tennessee	185

[1] Exclusive of New York City.

DENGUE IN SOUTHEASTERN STATES

During the week ended December 8, 1934, 81 cases of dengue were reported in Georgia, and 47 cases were reported during the week ended December 15.

The following table shows the number of cases of dengue reported in Florida for the weeks ended December 1 and December 8, 1934:

Locality	County	Number of cases, week ended—	
		Dec. 1, 1934	Dec. 8, 1934
Miami	Dade	3	3
Orlando	Orange	3	
Pensacola	Escambia	1	
	Hillsboro		1
	Lee		1
Total		7	5

WEEKLY REPORTS FROM CITIES

City reports for week ended Dec. 8, 1934

[This table summarizes the reports received regularly from a selected list of 121 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference]

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	0		0	0	2	1	0	1	1	7	33
New Hampshire:											
Concord	0		0	0	0	1	0	0	0	0	10
Manchester	0		0	0	1	0	0	0	0	0	15
Nashua	2			0		1	0		0	0	
Vermont:											
Barre	0		1	0	0	0	0	1	0	3	5
Burlington	2		0	0	0	4	0	0	0	0	12
Massachusetts:											
Boston	8		2	1	14	35	0	13	2	34	193
Fall River	2		0	27	2	0	0	1	0	2	27
Springfield	0		0	12	0	3	0	1	0	6	31
Worcester	0		0	1	3	14	0	1	0	18	35
Rhode Island:											
Pawtucket	0		0	0	2	0	0	0	0	0	8
Providence	1		1	0	2	8	0	3	0	17	54
Connecticut:											
Bridgeport	0		0	2	3	4	0	1	0	2	24
Hartford	0		0	161	4	0	0	4	0	0	45
New Haven	0		0	5	3	1	0	1	0	0	35
New York:											
Buffalo	2		1	31	9	20	0	5	0	32	137
New York	36	58	11	48	172	147	0	78	4	231	1,528
Rochester	0		0	57	3	12	0	1	0	23	59
Syracuse	0		0	1	3	7	0	0	0	6	35
New Jersey:											
Camden	0	3	0	1	5	4	0	0	0	10	33
Newark	1	16	1	3	6	16	0	5	1	45	88
Trenton	0	1	0	4	3	12	0	3	0	1	48
Pennsylvania:											
Philadelphia	12	16	3	9	42	62	0	22	0	171	528
Pittsburgh	11		0	19	15	29	0	6	3	24	139
Reading	0		1	1	2	1	0	0	0	8	23
Scranton	1			17		3	0		0	1	
Ohio:											
Cincinnati	13	1	3	1	14	29	0	1	0	5	144
Cleveland	9	30	0	9	18	28	0	12	0	47	180
Columbus	8	1	1	9	1	40	0	3	0	1	67
Toledo	0	3	3	24	5	20	0	5	0	6	66
Indiana:											
Fort Wayne	4		0	2	1	0	0	3	1	0	21
Indianapolis	8		0	1	19	24	0	1	0	16	
South Bend	0		0	27	0	2	0	0	0	1	13
Terre Haute	2		0	0	0	2	0	0	0	0	14
Illinois:											
Chicago	15	6	1	84	53	286	0	38	2	40	760
Springfield			0	0	2	4	0	1	0	6	18
Michigan:											
Detroit	7	19	0	24	12	84	0	18	1	47	234
Flint	0		0	1	1	12	0	4	0	6	21
Grand Rapids	0		0	1	0	12	0	1	0	7	29

City reports for week ended Dec. 8, 1934—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Wisconsin:											
Kenosha	0	----	0	1	1	10	0	0	0	8	7
Milwaukee	1	----	0	45	7	210	1	4	0	71	88
Racine	0	----	0	1	0	9	0	0	0	12	17
Superior	0	----	0	0	0	1	1	0	0	0	8
Minnesota:											
Duluth	0	----	0	107	3	0	0	1	0	0	18
Minneapolis	1	----	1	184	5	27	0	1	0	11	88
St. Paul	0	1	1	3	4	11	1	1	0	13	49
Iowa:											
Davenport	0	----	----	22	0	1	0	----	0	0	----
Des Moines	3	----	0	0	0	11	0	0	0	0	29
Sioux City	3	----	0	0	0	2	0	0	0	2	----
Waterloo	0	----	----	247	----	2	0	----	0	0	----
Missouri:											
Kansas City	1	----	3	1	20	14	0	8	0	1	108
St. Joseph	3	----	0	0	1	2	0	0	0	0	6
St. Louis	19	1	1	0	14	19	0	5	6	9	214
North Dakota:											
Fargo	0	----	1	0	0	7	0	0	0	5	6
Grand Forks	0	----	----	1	----	6	0	----	0	0	----
South Dakota:											
Aberdeen	0	----	----	3	----	1	1	----	0	4	----
Nebraska:											
Omaha	12	----	0	4	6	17	0	1	0	3	59
Kansas:											
Topeka	0	----	0	0	0	0	0	0	0	0	4
Wichita	1	----	0	0	3	2	0	0	0	0	23
Delaware:											
Wilmington	0	----	0	0	2	2	0	3	0	4	48
Maryland:											
Baltimore	1	2	0	4	22	47	0	12	0	36	225
Cumberland	0	----	0	0	1	2	0	1	0	0	10
Frederick	0	----	0	0	1	0	0	1	0	0	4
District of Columbia:											
Washington	11	----	0	5	13	24	0	9	0	4	151
Virginia:											
Lynchburg	1	----	0	4	2	2	0	1	0	6	13
Norfolk	1	----	0	1	4	2	0	1	0	4	35
Richmond	3	----	0	0	5	3	0	2	0	0	44
Roanoke	1	----	0	0	4	8	0	1	0	0	19
West Virginia:											
Charleston	2	2	1	12	2	13	0	1	1	2	25
Huntington	6	----	----	0	----	2	0	----	0	0	----
Wheeling	0	----	0	0	1	11	0	0	0	9	12
North Carolina:											
Raleigh	1	----	0	0	1	0	0	2	0	2	12
Wilmington	0	----	0	2	2	1	0	0	0	0	10
Winston-Salem	3	1	1	0	2	5	0	0	0	24	11
South Carolina:											
Charleston	0	26	1	0	4	0	0	3	0	0	34
Columbia	0	----	0	0	4	0	0	1	0	0	28
Greenville	0	----	0	0	0	0	0	0	0	3	3
Georgia:											
Atlanta	2	43	1	0	9	4	0	5	0	2	78
Brunswick	0	----	0	0	0	1	0	1	0	0	8
Savannah	0	3	1	0	3	0	0	2	0	2	23
Florida:											
Miami	2	----	0	0	0	1	0	0	0	0	28
Tampa	1	----	0	0	0	1	0	2	0	0	25
Kentucky:											
Ashland	2	2	0	0	0	1	0	0	0	0	1
Lexington	2	----	0	0	1	0	0	1	2	0	17
Louisville	12	2	2	3	6	22	0	3	1	12	73
Tennessee:											
Memphis	7	----	1	0	10	6	0	3	2	7	89
Nashville	4	----	0	0	8	6	0	2	3	1	50
Alabama:											
Birmingham	6	1	1	0	9	3	0	2	1	1	80
Mobile	2	----	1	0	0	0	0	1	0	0	27
Montgomery	1	----	----	0	----	1	0	----	0	0	----
Arkansas:											
Fort Smith	----	----	----	----	----	----	----	----	----	----	----
Little Rock	0	----	0	0	1	5	0	1	0	0	5
Louisiana:											
New Orleans	26	8	2	0	15	2	0	12	0	0	167
Shreveport	0	----	0	7	3	1	0	1	0	0	49

City reports for week ended Dec. 8, 1934—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Texas:											
Dallas	10	1	1	0	7	9	0	1	0	0	60
Fort Worth	1	------	0	0	6	6	0	4	0	3	46
Galveston	0	------	0	0	1	1	0	1	1	0	19
Houston	10	------	1	0	11	1	0	7	0	0	81
San Antonio	0	------	1	1	9	7	13	4	0	0	63
Montana:											
Billings	9	------	------	9	------	3	0	------	0	0	------
Great Falls	0	------	0	0	1	1	0	0	0	0	5
Helena	0	------	0	6	0	0	0	0	0	0	5
Missoula	0	------	0	0	1	0	0	0	0	0	7
Idaho:											
Boise	0	------	0	0	1	0	0	0	0	0	8
Colorado:											
Denver	2	49	1	183	11	108	0	2	0	4	86
Pueblo	3	------	0	0	2	6	0	0	0	0	11
New Mexico:											
Albuquerque	0	------	0	0	0	2	0	5	0	6	9
Utah:											
Salt Lake City	0	------	0	12	5	28	0	0	0	25	33
Nevada:											
Reno	1	------	0	0	1	1	0	0	0	0	6
Washington:											
Seattle	0	------	------	2	------	4	6	------	0	0	------
Spokane	0	1	1	5	1	1	0	1	0	0	45
Tacoma	0	------	0	0	2	0	4	0	0	1	31
Oregon:											
Portland	0	2	1	1	5	15	0	1	0	0	82
Salem	0	------	------	0	------	1	0	------	0	3	------
California:											
Los Angeles	9	26	1	5	14	63	0	17	1	3	309
Sacramento	3	1	1	0	3	2	0	2	1	0	31
San Francisco	1	4	3	2	7	18	0	11	0	9	165

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Boston	1	0	0
New York:			
Buffalo	1	0	0
New York	2	2	1
Ohio:			
Cincinnati	2	0	0
Cleveland	0	0	2
Indiana:			
Indianapolis	0	1	0
Illinois:			
Chicago	2	1	0
Michigan:			
Grand Rapids	0	0	1
Wisconsin:			
Milwaukee	0	0	5
North Dakota:			
Fargo	0	1	0
Maryland:			
Baltimore	0	0	1
Georgia:			
Atlanta	2	0	0
Utah:			
Salt Lake City	0	1	0
Washington:			
Spokane	1	1	0
California:			
Los Angeles	0	0	2
Sacramento	0	0	4

Dengue.—Cases: Charleston, S. C., 2; Atlanta, 2; Savannah, 44; Miami, 3.
Lethargic encephalitis.—Cases: Springfield, Mass., 1; Newark, N. J., 1; Trenton, 1; Pittsburgh, 1; Detroit, 1.
Pellagra.—Cases: Charleston, S. C., 2; Atlanta, 1; Savannah, 2; Louisville, 1; Montgomery, 1; Sacramento, 1; San Francisco, 1.
Typhus fever.—Cases: Savannah, 2; Dallas, 1.

FOREIGN AND INSULAR

INDIA

Vital statistics—First quarter ended March 31, 1934.—The following are vital statistics for India for the first quarter, ended March 31, 1934:

Population	263,626,328	Deaths from—	
Live births	2,286,733	Cholera	14,946
Live births per 1,000 population	34.7	Dysentery and diarrhea	56,160
Stillbirths	44,671	Plague	44,714
Stillbirths per 100 live births	1.9	Respiratory diseases	129,178
Deaths	1,552,005	Smallpox	25,186

PUERTO RICO

Notifiable diseases—4 weeks ended December 1, 1934.—During the 4 weeks ended December 1, 1934, cases of certain notifiable diseases were reported in the municipalities of Puerto Rico, as follows:

Disease	Cases	Disease	Cases
Chicken pox	16	Pellagra	1
Diphtheria	39	Pink eye	7
Dysentery	57	Ringworm	2
Erysipelas	3	Syphilis	38
Influenza	171	Tetanus	4
Malaria	1,409	Trachoma	5
Measles	62	Tuberculosis	959
Mumps	25	Typhoid fever	8
Ophthalmia neonatorum	4	Whooping cough	153

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Hygiene, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following tables must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given:

CHOLERA

[C indicates cases; D, deaths; P, present]

Place		Apr. 29–May 26, 1934	May 27–June 30, 1934	July 1–28, 1934	July 29–Aug. 25, 1934	Week ended— September 1934					October 1934				November 1934			
						1	8	15	22	29	6	13	20	27	3	10	17	24
Ceylon: Colombo	C		1															
China:																		
Amoy	C			[1] 1														
Canton	C		1															
Fort Bayard	C		1															
Hankow	C			2														
Shanghai	C			2	1													
Tientsin	C		1															
India	C	13,008	22,932	39,308	58,347	13,021	12,561	9,708	10,171	7,635	5,377	4,628	3,809	5,346				
	D	6,146	12,315	21,179	29,499	6,517	6,352	4,812	4,986	3,976	2,543	2,245	1,969	2,767				
Assam	C												5	38	39	17	56	215
	D													22	18	8	21	86
Bombay Presidency	C	957	830	2,985	11,364	1,502	1,437	1,121	1,094	820	591	621	341					
	D	486	393	1,005	4,125	603	571	430	434	317	246	306	182					
Bombay	C	[1] 7	3	1	1	1		1										
Calcutta	C	465	476	294	182	44	30	32	34	43	27	22	27	34	28	15	18	17
Chittagong	C	16	6	9	2	1								1				1
Madras Presidency	C	614	1,410	2,463	6,883	1,176	876	579	556	460	378	239	270	211				
	D	330	729	1,093	3,184	528	446	293	265	163	169	134	123	100				
Madras	C	1	25	5	145	8	21	10	7	14	3	3		1	16	27	14	2
	D		15	3	55	1	10	5	3	10	3	2			[3] 3	14	13	2
Negapatam	C														[3] 1			
Punjab	C					28			6	1								
	D					20			4	1								
Rangoon	C	2				1												
Vizagapatam	C				4		6											
India (French):																		
Chandernagor	D	4	2	6					1					1				
Karikal	C			1	16	7	11	14	8	7	2	3						
Mahe	C	11																
Pondichery	C			6	106	33	21	4		1					10			

[1] Suspected.

[2] Includes 4 imported cases.

[3] Imported.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

CHOLERA—Continued

[C indicates cases; D, deaths; P, present]

Place		Apr. 29–May 26, 1934	May 27–June 30, 1934	July 1–28, 1934	July 29–Aug. 25, 1934	Week ended— September 1934 1	8	15	22	29	October 1934 6	13	20	27	November 1934 3	10	17	24
Indo-China (see also table below):																		
Baclieu	D		2															
Pnom-Penh	C	1			2													
	D	2		1														
Poulo Condor Island	C		3															
Philippine Islands: Rizal Province—Manila	C		1															
Siam	C	4	1	1														
On vessels:																		
S. S. *Viking II* at Calcutta from Aden	C	1																
S. S. *Cape Ortegal* at Calcutta from Bombay	C		1															
S. S. *Jaladurga* at Calcutta from Rangoon	C		2															
S. S. *Khostan* at Calcutta from Karachi	C			1														
S. S. *Erinpura* at Port Swettenham	C				1													
S. S. *Aronda* at Rangoon from Calcutta	C					1												

Place		June 1934 1–10	11–20	21–30	July 1934 1–10	11–20	21–31	August 1934 1–10	11–20	21–31	September 1934 1–10	11–20	21–30	October 1934 1–10	11–20	21–31
Indo-China (French) (see also table above):																
Cambodia [4]	C	1		2	1	1		2						1		
	D	1		2	1	1		1						1		
Cochin-China [4]	C		10	9	4	2	6	1		2			1			
	D		8	3	4	2	4	1		1			1			

[4] Reports incomplete.

PLAGUE[1]

[C indicates cases; D, deaths; P, present]

Place		Apr. 29–May 26, 1934	May 27–June 30, 1934	July 1–28, 1934	July 29–Aug. 25, 1934	Week ended— September 1934 1	8	15	22	29	October 1934 6	13	20	27	November 1934 3	10	17	24
Angola. (See table below).																		
Argentina (see also table below):																		
Santa Fe.[2]																		
Santiago de Estero Province.[3]																		
Azores. (See table below.)																		
Belgian Congo	C		6	8												8		
Bolivia. (See table below.)																		
Brazil.[4]																		
British East Africa (see also table below):																		
Kenya	C	2	9	1	5	8	1	2	1	1	1				1	2	2	
Uganda	C	67	215	131	101	16	12	15	12	15	18	23	22	26	18	16		
	D	64	208	122	101	14	14	15	12	14	18	22	22	23	16	16		
Ceylon: Colombo	C	9		1					1								1	1
	D	9	1	1													1	1
Plague-infected rats		1					1								3			
China (see also table below):																		
Fort Bayard.[5]																		
Manchuria.[6]	D			22	8													
Tanghai Island	C		7															
Dutch East Indies:																		
Java—Batavia	C										[7] 2	3						
	D										2	3						
West Java	C	1,609	1,273	1,148	1,721	485	467	374	434	441								
	D	1,609	1,273	1,144	1,720	485	467	374	434	441								
Ecuador. (See table below.)																		

[1] Including plague in the United States and its possessions.

[2] According to a newspaper report, 1 case of bubonic plague occurred on Nov. 22, 1934, in Santa Fe, Argentina. No official report of this case has been received.

[3] A report dated May 17, 1934, states that 15 deaths from plague occurred up to that date in Santiago de Estero Province, Argentina.

[4] Plague has been reported in Brazil as follows: Alagoas State, week ended Dec. 15, 1934, 5 cases; Ceara State, week ended Dec. 8, 1934, 2 cases of plague with other suspected cases.

[5] During the week ended June 2, 1934, suspected cases of plague were reported in Fort Bayard, Kwangchowan Territory, China.

[6] A report dated Oct. 30, 1934, states that from June to Oct. 25, 1934, deaths from plague had been reported in Manchuria, China, as follows: Fengtien Province, Liaoyuan, 30, Shuangshan, 21, Tungliao, 41; Kirin Province, Changling, 12, Chienan, 26, Fuyu, 32, Hsinking City, 1, Nungan, 168.

[7] Imported.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D deaths; P present]

Place		Apr. 29–May 26, 1934	May 27–June 30, 1934	July 1–28, 1934	July 29–Aug. 25, 1934	Week ended— September 1934 1	8	15	22	29	October 1934 6	13	20	27	November 1934 3	10	17	24
Egypt:																		
Alexandria—Plague-infected rats		P	P	P	P	P		P		P		P		P		P		
Asyut	C	22	6															2
Beni-Suef	C														1			
Faiyum	C	1																
Gharbiya	C	1	6	22														
	D		2	6														
Minufiya	C		8															
Minya	C		8															
Hawaii Territory:																		
Hawaii Island—Hamakua district—																		
Kalopa—Plague-infected rats														1	1			2
Kukaiau—Plague-infected rats			1															
Paauhau	C														1			
	D														1			
Plague-infected rats													1					
Paauilo	C		1															
Pohakea—Plague-infected rats														1				
Maui Island—Makawao district—																		
Kahului (9 miles from)—Plague-infected rats												2						
Paia—Plague-infected rats												1						
India	C	4,905	774	921	3,032	1,161	1,350	1,223	1,421	1,485	1,586	1,567	1,318	1,171				
	D	3,825	657	578	1,777	728	807	763	791	892	867	847	737	663				
Bassein	C	3	7	5	5			1			1		1			2	1	
Plague-infected rats			1	1	3	1			2			1						1
Bombay Presidency	C	439	218	379	1,464	431	601	541	685	671	731	765	650					
	D	301	143	220	842	268	322	321	415	434	405	434	404					
Bombay	C	3	1	1					1									
Plague-infected rats		3	2						2			1						
Madras Presidency	C	34	42	194	333	135	150	117	74	77	96	84	74	55				
	D	11	15	98	165	62	82	70	52	30	44	57	47	35				
Moulmein	C				1													
	D				1													
Punjab	C										P		18	11	13	8	29	3
	D												10	7	8	6	20	1

Rangoon	C	3	5	1	1	2		1											
Plague-infected rats		3	3		1														
Indo-China (see also table below):																			
Bentre	C				1														
Longxuyen	C		1																
Pnom-Penh	D	2	4	1	1														
Sadec	C		1																
Saigon and Cholon	C	3	4	1	1		1										1		
Vinhlong	C		1																
Iraq: Baghdad	C	1	3	1															
Libya	C		5																
	D		1																
Madagascar. (See table below.)																			
Morocco: Tangier	C															4	3		
Peru (see also table below): Salaverry—Plague-infected rats			1																
Senegal. (See table below.)																			
Siam	C	1	2																
South-West Africa.[1]																			
Tunisia: Tunis—Plague-infected rats			4																
Union of South Africa: Orange Free State	C														2	1			
United States:																			
California:																			
Human plague—Tulare County	C		1																
Plague-infected ground squirrels:																			
Kern County		26																	
Modoc County			[2] 36	2															
Tulare County		33	6																
Oregon: Lake County	C	1																	
	D	1																	
On vessel: S. S. *Barjora* at Rangoon from Moulmein	C						1												
	D						1												

[1] From January to June 30, 1934, 20 cases of plague were reported in Ovamboland, South-West Africa.
[2] Includes 1 plague-infected wood rat.

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CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

Place		May 1934	June 1934	July 1934	August 1934	September 1934	October 1934
Angola	C	2					
Argentina (see also table above)	C		2	2	6	11	
Azores	C	3	3	5			
Bolivia	C	P					
British East Africa (see also table above):							
Kenya	C	5	6		13	5	
Uganda	C	90			103	54	
China: Kwangchowan	C		21	10	3		
	D		12	4	3		
Ecuador	C		7				
Indo-China (see also table above):							
Cambodia	D	5	4	2	3	3	4
Cochin-China	C	3	9	8	2	1	
Madagascar (central region)	C	87	71	97	160	291	444
	D	83	71	96	158	283	422
Peru (see also table above)	C		1		1		
Lima department	C					2	3
Senegal:							
Dakar [10]	C	9	33	55	52	17	13
	D	8	27	47	47	19	11
Diourbel [10]	C				5	1	
	D				3	1	
Louga [10]	C		2				
	D		2				
Rufisque [10]	C		18	33	42	18	8
Sebikotane [10]	C	9					
Theis [10]	C	26	64	50	39	6	6
Tivaouane [10]	C	35	32	27	82	26	21

[10] Reports incomplete.

SMALLPOX

Place		Apr. 29–May 26, 1934	May 27–June 30, 1934	July 1–28, 1934	July 29–Aug. 25, 1934	Week ended— September 1934: 1	8	15	22	29	October 1934: 6	13	20	27	November 1934: 3	10	17	24
Algeria:																		
Algiers Department	C	1	1	1										1				
Constantine Department	C		2				1							1				
Oran Department	C		3															
Angola. (See table below.)																		
Belgian Congo [1] (see also table below)	C			1	2	5												
Bolivia. (See table below.)																		
Brazil:																		
Porto Alegre (alsatrim)	C	1	2	2	5													
Sergipe State	C															P		

British East Africa:																	
Kenya	C	6	13	93	169	18	27	6	50	15			25	5	11	1	4	
Tanganyika	C	4	40	2	6			38	5		2		1	15				
British Somaliland	C	10		16			2	5			1	2		4	2			
British South Africa:																		
Northern Rhodesia	C		28				1	15										
Southern Rhodesia	C	14			2				1			2						
Bulgaria	C	6																
Cameroun (French). (See table below.)																		
Canada:																		
Alberta	C																[2] 2	
British Columbia	C				[2] 1													
Manitoba	C								[2] 1				[2] 1					
Saskatchewan	C										[2] 1		[2] 1					
Ceylon: Colombo	C							4	7	6	2	1			2	1	3	5
China:																		
Amoy	C	22	22	6	3													
Canton	C	1	1													1		2
Dairen	C	74	45	6		2												
Foochow	C		P	P	P				P		P		P		P		P	
Hangchow	C	5		2														
Hankow	C	1	1				1					1						
Hong Kong	C	[3] 22	10			1									[4] 1		[4] 1	
Kwantung Leased Territory	C	18	24															
Macao	D	3	1												1		1	1
Shanghai	C	56	25	8	3		1						1	1				1
South Manchuria Railway Zone	C	23	18															
Swatow	C	6	7		1													
Tientsin	C		1	2									2					
Tsingtao	C				1								1					
Chosen. (See table below.)																		
Dahomey. (See table below.)																		
Dominican Republic: Santo Domingo	C	1	1															
Ecuador. (See table below.)																		
Egypt:																		
Alexandria	C				2													
Aswan	C	3	3	4														
Asyut	C	6	2															
Cairo	C	2	3	1	4	1												
Dakahliya	C	1																
Damietta	C		1															
Faiyum	C	17	55	2					1									
Gharbiya	C	10	4															
Girga	C	13	7	4														
Minya	C	9	8	15	3				2									
Port Said	C	1																
Qena	C	1	4															
Sharkiya	C												41	33				
Provinces	C	74	89	39	31	5	1	1	3	3	3	1	42		3			
Eritrea	C	1			1													

[1] A report dated Oct. 23, 1934, states that 142 cases of smallpox with 10 deaths have been reported in Belgian Congo.
[2] For 2 weeks.
[3] Includes 2 imported cases.
[4] Imported.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		Apr. 29–May 26, 1934	May 27–June 30, 1934	July 1–28, 1934	July 29–Aug. 25, 1934	Week ended— September 1934 1	8	15	22	29	October 1934 6	13	20	27	November 1934 3	10	17	24
Finland. (See table below.)																		
France. (See table below.)																		
Gold Coast. (See table below.)																		
Great Britain:																		
England and Wales	C	11	10	3						1		1				1		
London	C	10	7									1						
London and Great Towns	C	10	8							1		1						
Greece: Salonika	C	4	9	7	8							1	1	1				
Guatemala. (See table below.)																		
Honduras:																		
Belize	D		1															
Tegucigalpa	C	P	P		4		2											
India	C	36,595	29,379	16,344	12,684	1,884	2,404	1,542	1,777	1,231	998	1,270	960	1,193				
	D	8,185	7,028	3,966	3,269	459	596	360	449	244	198	227	204	217				
Bassein	C	1	5	1	1													
	D	1	1	1	1													
Bombay Presidency	C	3,181	2,803	1,000	1,134	178	267	207	243	207	141	170	135					
	D	577	555	249	237	42	44	36	46	32	36	36	36					
Bombay	C	26	13	5	4	1		2	5	6	1	1	6		1	1	3	
	D	11	9	2	3			1	4	1	3	1	1		1	1	2	
Calcutta	C	157	73	23	7			12		4	1	2					4	
	D	112	60	18	8			3	2	4							1	
Cochin	C	8	1															
Karachi	C	14	7	13	6			2	1									
Madras Presidency	C	7,932	6,223	3,576	3,397	651	604	522	558	585	579	769	683	677				
	D	1,247	1,162	588	616	139	94	98	94	90	93	97	125	99				
Madras	C	64	35	34	19	5	7	4	1	5	7	8		1		2	1	2
Negapatam	C	5	8	7	4	1			2		1	4		3		1	1	1
Punjab	C													5	11	20	16	13
Rangoon	C	37	10	6	3		1	1				2	1			2	1	
Tuticorin	C			6			1	1		1	1		1					
Vizagapatam	C	33	4	3	8					1							5	11
India (French):																		
Chandernagor	D	2	2	1	2	1												
Karikal	C	1							1		1							
Pondichery	C	96	134	131	170	66	56	40	29	45	40	33		26	35			
	D	60	72	78	103	22	44	30	19	32	38	19		24	10			

India (Portuguese)	C				27													
Indo-China (see also table below):																		
Haiphong	C	17	7			1												
Pnom-Penh	D				1													
Tourane	C	5	24	17	9	3					3			1		3		
Iraq	C	27	88	13	5			6	1	4	2	1						
Amara liwa	C	2																
Arbil	C			15					3	3	2							
Baghdad	C		1		2				[4] 1		1							
Basra	C	5																
Italy:																		
Genoa	C				8	2												
Milan	C						1	1										
Ivory Coast. (See table below.)																		
Japan	C	12	7	6														
Aomori Prefecture	C			3														
Kobe	C			1														
Nagasaki	C	1																
Osaka	C	2	2															
Liberia.[5]																		
Mexico:																		
Chihuahua	C			1			1									2		
Guadalajara	D	1																
Mazatlan.[6]																		
Mexico, D. F.	C	14	12	5	6	2	3	2	1		5	1						
Monterrey	C				1													
Piedras Negras	C	1																
Rosita	C	11																
San Luis Potosi	D	2		1														
Teitipac.[6]																		
Torreon	D	1	1															
Morocco. (See table below.)																		
Mozambique. (See table below.)																		
Nigeria	C	1,277	136		239		163		[3] 52		17	82	24					
Lagos	C	15	9	2	3	1	1	3										
Nyasaland. (See table below.)																		
Palestine	C	2	7															
Persia	C			2	3					2	2	4	1		1	3		
Teheran	C	1		7	1											1		
	D		1			1								1	1			
Peru. (See table below.)																		
Poland	C	1		1					1				1				1	
Portugal (see also table below):																		
Lisbon	C	8	6	4							1			1	1	1		
Oporto	C									1					1			
Portuguese East Africa. (See table below.)																		
Salvador	C	60	35	[3] 21	30	[3] 10	2				[7] 13				9			1
Siam	C	5	96	6			32				2	1		1	13			

[3] For 2 weeks.
[4] Imported.
[5] A report states that from February to Sept. 10, 1934, 233 cases of smallpox with 79 deaths had been reported in Saneyea, Liberia. All sanitary measures have been taken.
[6] A report dated Aug. 27, 1934, states that smallpox has appeared in the suburbs of Mazatlan, Sinaloa, Mexico; the report also states that 104 deaths from smallpox have occurred in Teitipac, Oaxaca, Mexico.
[7] For 3 weeks.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		Apr. 29–May 26, 1934	May 27–June 30, 1934	July 1–28, 1934	July 29, Aug. 25, 1934	Week ended—											
						September 1934					October 1934				November 1934			
						1	8	15	22	29	6	13	20	27	3	10	17	24
Sierra Leone	C	77	226	67	80			[2] 143		[2] 242		[2] 89		[2] 125				
Spain	C	64	131	54	47	11	5	4		9	3	5	6	8	36	54		
Straits Settlements: Singapore	C	1											1					
Sudan (Anglo-Egyptian)	C		7	3	4			1					1					1
Syria:																		
Beirut	C	2			2													
Damascus	C																26	
Provinces	C	31	31	50	32		28	27	17	6	13	14	11	13	15	35	39	
Trans-Jordan	C		2	1												[4] 1		
Turkey. (See table below.)																		
Union of Soviet Socialist Republics. (See table below.)																		
Union of South Africa	C			P	P													

[2] For 2 weeks.

[4] Imported.

On vessels:

S. S. *Kut Sang* at Hong Kong from Amoy	Present	May	9, 1934
S. S. *Tjinegara* at Hong Kong	Present	May	16, 1934
S. S. *Britannia* at Port Said from Liverpool	1 case	May	31, 1934
S. S. *Rohna* at Penang from Madras	1 case	June	14, 1934
S. S. *Rajula* at Penang	1 case	June	28, 1934
S. S. *Rohna* at Penang from Madras	1 case	July	12, 1934

On vessels—Continued.

S. S. *Tacoma* at Moji from Dairen	1 case	July	28, 1934
S. S. *Ethiopa* at Rangoon from Madras	1 case	Sept.	3, 1934
S. S. *Ussuri Maru* at Kobe from Dairen	1 case	Sept.	24, 1934
S. S. *Rohna* at Penang from Madras	1 case	Oct.	4, 1934
S. S. *Erinpura* at Rangoon from Madras	1 case	Oct.	8, 1934

Place		May 1934	June 1934	July 1934	August 1934	September 1934	October 1934
Angola	C	35					
Belgian Congo(see also table above)	C	67	110	360	204	183	
Bolivia	C			82	136	70	
Cameroun (French)	C			1			
Chosen	C	65	25	18	5	15	
Dahomey	C	5		83	31		
Ecuador	C			1			
Finland	C			1			
France	C	10			3	2	3
Guatemala	C				1		2
Indo-China (see also table above)	C	592	215	192	150	87	202
	D	76	39	29	39	18	39
Ivory Coast	C		4	2			
Morocco	C	3	2	5	2	8	
Mozambique	C			3	4	6	1
Nyasaland	C	36	63	31	16	29	17
Peru	C	16	29	24	100	12	
Portugal (see also table above)	C	110	40	70	60	36	
	D	1	5	4	6	2	
Portuguese East Africa	C	34	5	3	4	6	1
Turkey	C	5	2	17	4	16	2
Union of Soviet Socialist Republics	C	574	403				

TYPHUS FEVER

Place		Apr. 29–May 26, 1934	May 27–June 30, 1934	July 1–28, 1934	Week ended— August 1934 4	11	18	25	September 1934 1	8	15	22	29	October 1934 6	13	20	27	November 1934 3	10	17
Algeria:																				
Algiers Department	C		18	1			1							1			3	2	1	1
Constantine Department	C	41	91	32	3	6	3		3	1	1			1			3			
Bone	C						1		1											
Constantine	C																2			
Oran Department	C	5	5	2			10													
Basutoland	C												20							
Belgian Congo [1]	C		208	135	52	30	26		13	19	13	12	5	4	7	6	3	4	4	1
Bolivia. (See table below.)																				
British East Africa: Uganda	C	2	6					1										10		
Bulgaria	C	45	19	2												2	5			
Chile	C	[2] 1,192	1,044	1,180	260	278	300													
Concepcion	C			13																
Iquique	C													[3] 4						
Santiago	C	164	321	365	73		112													
Tarapaca Province.[4]																				
Tocopilla	C										1									
Valparaiso	C	11	22	30	2	8	7	4	3	8	6	2	2		6	3	8	10	9	6

[1] From Apr. 18 to May 27, 1934, 256 cases of typhus fever with 7 deaths were reported in Belgian Congo. [2] For 9 weeks. [3] Imported.
[4] A report dated July 13, 1934, states that 41 cases of typhus fever with 7 deaths have been reported in the villages of Usmagama and Pachica, Tarapaca Province, Chile.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

[C indicates cases; D, deaths; P, present]

Place		Apr. 29–May 26, 1934	May 27–June 30, 1934	July 1–28, 1934	Week ended— August 1934				September 1934					October 1934				November 1934		
					4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17
China:																				
Hangchow	C		1																	
Hankow	C		1												1					
Harbin	C	P	3																	
Nanking	C	3	3																	
Shanghai	C		3								1									
South Manchuria Railway Zone	C	1	3																	
Tientsin	C	5	2																	
Chosen. (See table below.)																				
Czechoslovakia. (See table below.)																				
Egypt:																				
Alexandria	C	4	9	2	1											1				
Asyut	C	7	4	1																
Beheira	C	347	263	52	7	9	15			1										
Cairo	C	7	1	2																
Dakahliya	C	139	67	17	2	5														
Damietta	C	5	2	1											1					
Faiyum	C		2												1					
Gharbiya	C	328	193	71	12	4	6			1		2			1					
Girga	C	1	1			1														
Minufiya	C	127	87	26		3	2													4
Minya	C				1															
Port Said	C		4																1	
Qena	C		13	1	1	5									1	2				
Sharkiya	C		22	15	1		2			1										
Provinces	C	1,360	695	176	25	28	27	18	13	4	10	2	6	2	3	3	2	2		
Estonia	C						1													
Finland. (See table below.)																				
Greece (see also table below): Salonika	C					3	3					1	1	1	1		1	1		
Guatemala. (See table below.)																				
Hungary	C											1								
Iraq	C	27	65																	
Baghdad	C	6	14			2		1	1					1						
Kirkuk liwa	C	41	59																	
Mosul liwa	C			14	3						3									

Irish Free State:																				
Cork County—Castletown	C			5																
Waterford County—Lismore	C									1				1						
Wicklow County—Altidore	C			7																
Italy:																				
Leghorn	C					1		1		2	1	1					1			
Palermo	C			1																
Japan:																				
Aomori Prefecture	C				3	1														
Kobe	C													1						
Nagasaki	D											1								
Latvia. (See table below.)																				
Lithuania	C	12	4	17	3	2		2				2			2		1		1	
Mexico:																				
Guadalajara	D									1										
Mexico, D. F	C	64	108	38	8	12	5	9	4	11	6	5		8	6					
Saltillo	D										2				1					
San Luis Potosi	D		1	1										1		1				
Torreon	C			1	1										1		4			1
Morocco	C	34	45	18	36	6		1	1									1		
Palestine	C		4	5				1	2		1			1	1	2				
Haifa	C			[1]1				1	1					1	[1]1	[1]1	[1]1			[1]2
Persia	C	230	217	112	9	21	13	6	17	5	6	10	9	4	8		7	10	5	
Teheran	C	36	22	25	1	4	1	1	2		2	3	3	1						
Peru. (See table below.)																				
Poland	C	426	284	148	20	20	25	12	10	13	9	8	13	13	9	13	13	14	12	16
	D	28	23	12	1		1	4			1			3	1		1	2	1	3
Portugal (see also table below): Oporto	C			1						1										
Rumania. (See table below.)																				
Scotland	C	3																		
Spain: Catalonia	C		27																	
Straits Settlements: Singapore	C			2																
Syria: Beirut	C				1															
Trans-Jordan	C	6	16	4	3	1														
Tunisia:																				
Tunis	C	2	22	1				1							1			1		
Provinces	C	90	99	46		13	1			1	2		15	2		4	16	18	1	14
Turkey. (See table below.)																				
Union of Soviet Socialist Republics. (See table below.)																				
Union of South Africa. (See table below.)																				
Yugoslavia. (See table below.)																				

[1] Imported.

[1] Includes 1 imported case.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

[C indicates cases; D, deaths; P, present]

Place		May 1934	June 1934	July 1934	August 1934	September 1934	October 1934
Bolivia	C	98	46	39	91	33	
Chosen	C		6	41	23	7	
Czechoslovakia	C	66	20	3			
Finland	C	4					
Greece	C	3		9	10	7	
Guatemala	C	42	18	24	36	31	18
Latvia	C	3					3
Peru	C	24	59	43	24	63	
Portugal	C	28	21		4	7	
Rumania	C	176	73	16	24	16	48
Turkey	C	39	15	9	22	10	16
Union of Soviet Socialist Republics	C	3,586	1,889				
Union of South Africa:							
Cape Province	C	119	250	289	272	437	
Natal	C	7	10	26	15	6	
Orange Free State	C	343	884	709	510	492	
Transvaal	C	8	38	24	12	105	
Yugoslavia	C	398	118	58	27	12	31

YELLOW FEVER

[C indicates cases; D, deaths; P, present]

Place		Apr. 29–May 26 1934	May 27–June 30, 1934	July 1–28, 1934	Week ended— August 1934 4	11	18	25	September 1934 1	8	15	22	29	October 1934 6	13	20	27	November 1934 3	10	17
Brazil:																				
Amazonas State—Fonte Boa	C			1																
Bahia State: Victoria Bank	C		1																	
Ceara State																				
Carius:	C	1	1																	
Iguatu	D			1	1															
Novo Oriente	C			1																
Santa Quiteria	C		1																	
Mato Grosso State: Coronel Ponce	C	1																		
Para State—St. Sebastian	C	1																		
Colombia: Intendencia of Meta—Restrepo.[1]																				
French West Africa—Guinea—Kindia	C										1									

Gambia:																					
Bathurst	C																				1
St. Mary's Island	C																				[1] 2
Gold Coast:																					
Kokobee,[1]																					
N Kaw Kaw	C			1																	
Ivory Coast:																					
Abidjan	C		3											1							
	D		2	1										1							
Agboville	C											1									
Bingerville	C					1															
Bobo-Diolasso	D																[1] 1				
Rubino	C	2																			
Tirailleur	C																	1			
Zuenoula.[4]																					
Niger Territory:																					
Maradi	C									1											
Zinder	C			1	2	1	2									1					
	D			1	2		2									1					
Senegal: Matam	C	1																			
Sudan (Anglo-Egyptian): Wau	C		1																		

[1] A report dated Nov. 28, 1934, states that 3 deaths from yellow fever had been reported in Restrepo, Intendencia of Meta, Colombia.
[2] Suspected.
[3] During the week ended Nov. 24, 1934, 1 case of yellow fever was reported in Kokobee, Saltpond district, Gold Coast.
[4] During the week ended Dec. 8, 1934, 1 case of yellow fever was reported in Zuenoula, Ivory Coast.

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